



SOHIO ALASKA PETROLEUM COMPANY

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ANCHORAGE, ALASKA

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ANCHORAGE, ALASKA 99502-0612

Douglas L. Lowery
Alaska Department of Environmental Conservation
Northern Regional Office
Pouch 1601
Fairbanks, Alaska 99707

July 15, 1985

RE: 1985 Compliance Testing - Prudhoe Units

Dear Mr. Lowery:

The following is in response to Mr. Coutts letter of May 21, 1985 and your letter of May 28, 1985. These letters have identified ADEC's concern over the turbine source testing method for NO_x and have requested source testing for CO on both our Sulzer and Cooper Rolls turbines.

The NO_x test method utilizes a water knockout pot at the sample port. This is a dry glass vessel which has a residence time long enough to allow the gases to cool down and for water vapor which may condense in the sample line to drop out. As water vapor collects it is taken out of the glass vessel. The gas never passes directly through water therefore H_2NO_3 or HNO_2 tests on the water were unnecessary. Also from past source tests the amount of vapor which condensed out and was collected in the vessel has been so insignificant it could not warrant analysis. We plan to continue using the EPA Method 20 for source testing of NO_x this summer. If you have additional questions please contact either Lynn Billington or myself so that further clarification can be made.

Although Sohio feels that CO source testing is not appropriate due to the minimal CO air impacts from the Prudhoe Bay permitted sources ADEC is exercising their right to require the Prudhoe Bay Unit to carry out CO source testing on the Sulzer and Cooper Rolls turbines. Therefore Sohio will monitor CO in addition to NO_x during the source tests carried out this summer.

USEPA REG

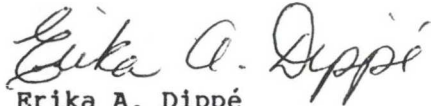


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In regards to the schedule set up previously for the source testing recent facility shutdown changes necessitate a test schedule change. We will be testing the week of August 26th. I hope this will fit with your schedules.

If there are any questions don't hesitate to call either Lynn M. Billington at 564-5206 or myself at 564-5495.

Sincerely,

A handwritten signature in cursive script that reads "Erika A. Dippé".

Erika A. Dippé
Environmental Engineer

EAD/2600Q



STATE OF ALASKA
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

JACK COUTTS, P.E.
ENVIRONMENTAL ENGINEER
NORTHERN REGION

MAIL - BOX 1601
OFFICE - 675 SEVENTH AVE.

FAIRBANKS, ALASKA 99707
PHONE (907) 452-1714

cc: J. Coutts
L. Verrelli
L. Dietrick
R. Kreizenbeck, EPA
R. Nye, EPA

File

Source tests

300.16.036

RECEIVED

JUL 19 1985

DEPT. OF ENVIRONMENTAL
CONSERVATION
NRO

300-416-036
9/5/85

452-1714

September 23, 1985

Northern Regional Office
Pouch 1601
Fairbanks, Alaska 99707

J. A. Ives
ARCO Alaska, Inc.
P. O. Box 100360
Anchorage, Alaska 99510

Ref. 3

Dear Mr. Ives;

Re: Source Test Data

The Chemecology revision to report #2119 to ARCO lists the power turbine capacity during the source test. I could not find anywhere in the report how, or on what basis, the percent capacity was calculated. Apparently in the past it has been the ratio of actual to rated power shaft RPM. I feel that exhaust emissions are more closely related to fuel consumed than to RPM. If you or the turbine manufacturers have data which show otherwise, please present it. If not, I request that you list all future capacities (%load) in terms of:

$$\frac{100 \times \text{BTU Input Actual}}{\text{BTU Input Design or Base Load.}}$$

EPA method 20 source tests for NOX have been conducted without an NO₂ to NO converter at the stack. Consequently, some of the NO₂ has reacted with the condensate collected in the moisture trap to form nitrite - nitrate (NO₂⁻ - NO₃⁻). This absorbed NO₂ has not made it to the NOX analyzer. Since your source test contractor has not elected to install an NO₂ to NO converter ahead of the moisture trap, I hereby request that the NO₂⁻ - NO₃⁻ in the condensate be added to the gas sample NOX concentration. Method 20 states: "As a guideline, an NO₂ to NO converter is not necessary if the gas turbine is operated at 90 percent or more of peak load capacity". The DEC is not accepting that guideline at present. If the results from your September source tests show that the absorbed NO₂ is an insignificant portion of the NO₂ in the flue gas, then DEC will accept that guideline.

For your information, I have enclosed a description of a procedure for converting the concentration of nitrite - nitrate in the condensate into the concentration that it was in the flue gas sample.

If you have any questions on the two above requests, please contact Jack Coutts at this office.

Sincerely,

Douglas L. Lowery

Douglas L. Lowery
Regional Environmental Supervisor

Enclosure
Distribution list

200-016-036
9/5/85

452-1714

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Regional Environmental Supervisor

Enclosure
Distribution list

J. A. Ives

-2-

September 23, 1985

Distribution list:

Mike Johnston, EPA/Juneau

Al Ewing, EPA/Anchorage

L. Verrelli

L. Dietrick

300.16.036

DLL/deb

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Northern Regional Office

Procedures for converting $\text{NO}_2^- - \text{NO}_3^-$ in sample condensate to NO_2 in gas sample.

Reference EPA CFR Title 40, Pt. 60, Appendix A, Method 20.

This procedure is to be used for the condensate collected in the moisture removal trap when a NO_2 to NO converter is not installed ahead of the moisture trap.

BASIC FORMULA:

$$\text{NO}_2 \text{ in gas phase} = (\% \text{H}_2\text{O condensed})(\% \text{H}_2\text{O in flue gas}) \\ (\text{concentration of NO}_2 \text{ in condensate, mole basis})$$

If $\text{NO}_2^- - \text{NO}_3^-$ is measured in terms of $\text{mg } \frac{\text{N}}{\text{liter H}_2\text{O}}$, then

multiply by $\frac{46}{14}$ to convert to $\text{mg } \frac{\text{NO}_2}{\text{liter H}_2\text{O}}$, then

multiply by $\frac{18}{46}$ to convert to $\frac{\text{moles NO}_2}{10^6 \text{ moles H}_2\text{O}}$.

The % H_2O in the flue gas can be calculated from the equation for complete combustion and excess air. All fuel H is assumed to be converted to H_2O . The water vapor present in the air (for combustion and excess) should be included.

The fraction of the flue gas water vapor that is condensed in the impinger depends upon the impinger outlet temperature and pressure. Since the temperature is below the dew point, the partial pressure of the water in the vapor phase (exiting the impinger) is equal to the vapor pressure of water at the impinger outlet temperature. By definition, partial pressure is total pressure times mole fraction.

$\text{NO}_2^- + \text{NO}_3^-$
 $\rightarrow \text{NO}_2$

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Northern Regional Office

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MEMORANDUM

State of

Ref 2

TO: L. Verrelli
ADEC/Juneau

DATE: September

FILE NO: 300.16.

TELEPHONE NO: 452-1714

FROM: J. Coutts *JC*
ADEC/NRO

SUBJECT: Trip Report, North Slope
September 2 - 5, 1985

From Sept 2 thru the 5th, I observed 5 source tests and conducted an air emission inspection at 3 facilities on the North Slope.

Source tests for O₂, NO_x, and CO were conducted on the 7800HP Sulzer Turbine at GC-2 (Sohio), the 29,000HP Cooper Rolls turbine with and without its 320 MMBTU/hr supplemental fired heater, at the seawater injection plant west (SIPW) (Sohio). The 67.5 MMBTU/hr Broach Heater, and the 29,000HP Cooper Rolls Turbine with and without its 125 MMBTU/hr supplemental fired heater, at the ARCO seawater injection plant (SIPE) were also tested.

I had the source test firm save the flue gas condensate collected in the sample train so I could analyze it for nitrite-nitrate (NO₂ - NO₃). I felt that a portion of the NO₂ in the sample stream was being absorbed in the condensate to form nitric and nitrous acid. The condensate from the first two turbine tests (Sulzer and Cooper Rolls) contained 100+ ppm NO₂ - NO₃. The NO₂ - NO₃ analysis was accomplished with a HACH Kit using the cadmium reduction method. The method is not very accurate because the color continued to develop after the two minute reaction time. After proper concentration conversion, SOHIO and ARCO, or their consultants, will add the NO₂ - NO₃ to the gas phase NO_x to come up with the total NO_x emission.

I inspected the ARCO flow stations #1 and #2 and the ARCO central compressor plant (ccp). The attached inspection reports contain an updated on-site equipment list. Most stack opacities could not be accurately read because of low clouds and fog.

On the 3rd, I inspected flow station #1 and observed the source test of the 7800HP Sulzer Turbine at SOHIO's gathering center #2.

On the 4th, at the SOHIO SIPW, I observed the source test of the exhaust from the Cooper Rolls turbine (29,000HP), with and without its supplemental fired heater. The CCP was also inspected on the 4th.

During the afternoon of 9-4-85, I toured the North Slope Borough incinerator with Bob Kotjan, Production Manager, and with Dave Waznick, their engineer who will be responsible for seeing that emission controls are incorporated into the incinerator. Dave will, by September 16, 1985,

MEMORANDUM

State of Alaska

TO: L. Verrelli
ADEC/Juneau

DATE: September 19, 1985

FILE NO: 300.16.036 *9/19/85*

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September 19, 1985

provide a task list for their compliance order. Dave asked for technical assistance in reviewing contractor proposals and engineering designs for the emission controls. I advised him that good combustion control should be considered along with a dust control device. Poor combustion control may be contributing to the incinerator's high concentration of particulate emission. I also felt that a high concentration of moisture in the solid waste was causing part of the problem. That morning, I inspected a pile of trash being prepared for open burning at the Borough's Oxbow landfill. That pile contained several tires and many plastic buckets/drums and other plastic containers. I informed Bob that burning tires and plastics was prohibited. Bob said he would have those materials pulled from the pile. Later on that day NSDO personnel observed tires being pulled from the pile.

On the 5th, I observed a source test (retest from last year) on the 67.5 MMBTU/hr Broach furnace, and on the 29,000HP Cooper Rolls turbine with and without supplemental fired heater at the ARCO SIPE. Flow station #2 was also inspected on the 5th.

The furnace for the crude oil topping unit at Kuparuk (CPF-1) was to be tested on the 6th. Since I returned to Fairbanks on the night of the 5th, I was not able to observe that source test.

All source testing was conducted by Petro Chem Environmental Services. That is not the same company that performed the testing in August and October 1984. However, the same people conducted the tests both years.

In the October 1984, source tests, there was a discrepancy on the reported operational capacity of the Cooper Rolls Turbine at the SIPE. The original Chemecology report #2119 said 100% capacity; the revised report said 60%. It is also not clear as to what parameter is used to determine turbine capacity (%Load). Capacity can be expressed in terms of heat input (BTU/Time) or shaft speed (rpm). Shaft speed (which they have been using) should not be used unless ARCO can demonstrate that it is directly proportional to heat input.

The October 1984 tests reported that the CO emission from the Cooper Rolls 29,000HP turbine was approximately 3 times the permit limit, and the supplement fired heater oxidized a considerable portion of the NO to NO₂. It will be interesting to compare the 1985 to the 1984 results for ARCO's Cooper Rolls turbine and to compare the SOHIO and ARCO results for the same turbine.

Persons

J. Ives said that ARCO's consultant, Fluor Corporation, will be submitting a report on the excess CO and NO₂ emissions from ARCO's Cooper Rolls turbines with/without supplemental fired heaters. DEC should receive a copy of that report by October.

L. Verrelli

-3-

September 19, 1985

I am writing to ARCO and SOHIO requesting that in their source test reports, they:

- 1) Report turbine loads in terms of heat input, and
- 2) Measure the NO_2 - NO_3 in the sample condensate and add it to the reported flue gas concentration of NO_x .

HJC/geb